REMARKS

1. Claims 1 – 6 are in the case. Claim 2 has been amended. Applicant has amended the Specification to satisfy an objection by the Examiner. No new matter has been added by the amendments to the Specification. I do not believe that any additional filing fees are due; however, should there be any additional fees due, please charge Deposit Account No. 11-0245.

2. The specification was objected to because of an informality. Applicant corrected the informality by amending the heading on page 2 of the application.

3. Claim 2 was objected to because of an informality. Applicant corrected the informality by amending claim 2 as suggested by the Examiner. A new listing of the claims is enclosed.

4. 35 U.S.C. §103 Rejection. The Examiner bears the initial burden of presenting a prima facie case of obviousness. The focus in any §103 analysis is on the differences between the claimed subject matter and the prior art. The Examiner argues that claims 1, 2 and 5 are obvious and unpatentable over Sakamoto in view of Rodal and Palmin. I respectfully submit that there is insufficient factual evidence to support the Examiner's obviousness rejection as particularly shown by the discussion below.

a. Combining the cited references does not create the present invention. The Examiner argues that Sakamato discloses all of the elements of claims 1 and 5 with the exception of the use of fuzzy logic and a PWM signal.

The Examiner acknowledges that Sakamato does not teach the use of fuzzy logic in a velocity controller. However, the Examiner argues that Palmin discloses fuzzy logic. Palmin does not teach the use of fuzzy logic in a controller. Palmin uses traditional logic and gate technology in its control system, a system which uses absolute value corrections. In contrast, the fuzzy logic contemplated by the present invention operates at a higher level of sophistication, with the commands being written in C and compiled into ARM language. (See Specification at page 6, line 6).

Additionally, the disclosures of Sakamoto, Rodal, and Palmin do not teach the components or connectivity of the velocity controller of the present invention. In the present invention, fuzzy logic estimator 7, upon receiving the PWM signal to motor 6 and the motor current, generates an estimated motor velocity. In contrast, Sakamoto generates its estimated velocity by using the motor current and the current based on the load torque without the use of fuzzy logic. In Sakamoto the integration element operates on the output of a junction which has as its intake the desired velocity and the position estimate, in contrast to the present invention which does not use a position estimate. Additionally, the observed velocity

in Sakamoto is operated upon by Sakamoto's proportion element without first being compared with the desired velocity, as is done in the current invention. (see Fig. 1 of Sakamoto in contrast to Figure 1 of the instant invention.) Because these key elements are missing from Sakamoto, and because the Examiner acknowledges that the PMW and fuzzy logic elements are not present in Sakamoto; the resulting combination of Sakamoto with Rodal or Palmin, even if one assumed the PMW and fuzzy logic elements were present in the Rodal or Palmin references, would not create the present invention.

b. No basis in the art to combine references. To argue that it would be obvious to one of ordinary skill in the art that Sakamoto could be combined with Rodal is merely a hindsight reconstruction of the claimed invention. There is no other source other than the application itself which contains the suggestion to combine such elements. Sakamoto is concerned with the use of position information to help control motor velocity. It does not suggest in any way that its disclosure should be combined with the use of PWM signals or fuzzy logic.

Palmin also uses position information. Palmin produces an absolute value comparison for determining a change in motor current. Palmin then uses a zero crossing detector to determine in which direction the change should be made. Palmin does not employ fuzzy logic for determining a velocity estimate. Palmin's concern is stepping up the control

signal so that is may be used to set a motor current, a traditional amplifier function as the title implies.

Rodal discloses a system in which a nominal DC voltage, which is being supplied to a motor, is compared to an estimated velocity value for the motor. Rodal does not use fuzzy logic for velocity control. The only added feature from Rodal is the compensation for back EMF.

5. Based on the above amendments and remarks I believe that all of the claims remaining in the case are allowable and an early Notice of Allowability is respectfully requested. If the Examiner believes a telephone conference will expedite the disposition of this matter he is respectfully invited to contact this attorney at the number shown below.

Respectfully submitted,

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Dated: June 17, 2003

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CLAIMS (VERSION WITH MARKINGS TO SHOW CHANGES MADE)

1. (original) A velocity controller for an electric motor, said motor having an input PWM signal and a motor current, said velocity controller comprising:

(1) an estimator connected to said motor, said estimator adapted to use fuzzy logic to generate an estimated motor velocity after receiving said PWM signal and said motor current; and

(2) a PI controller connected to said estimator and said motor, said PI controller adapted to generate a PWM signal after receiving a reference velocity and said estimated motor velocity.

2. (amended) The <u>velocity</u> controller in claim 1 wherein said PI controller comprises:

(1) an initial summing junction which compares said reference velocity and said estimated motor velocity and generates an error signal;

(2) an integrator which receives said error signal and generates a value for multiplication by an integral constant;

(3) a means for multiplying said error signal by a proportional constant;

(4) a means for multiplying said value received from said integrator by an integral constant; and

(5) a final summing junction which add the value of the signal generated by said

proportional constant means and the value of the signal generated by said integral constant means and generates a sum as a PWM signal to said motor.

3. (original) A priming station disposed in a printer having a print head, said priming station comprising:

(1) a cap connected to a cap carriage, said cap carriage being operably connected to a helical gear and being adapted to move in a path;

(2) a motor connected to a worm gear, said worm gear being operably connected to said helical gear so that when said motor is energized said cap carriage will move along said path;

(3) said cap carriage having a prime position along said path, said prime position occurring when said cap comes to a stop against said print head when said print head is in a prime position;

(4) a blotter positioned to stop and blot said cap as said cap travels to a blotting position along said path; and

(5) a velocity controller controlling said motor, said motor having an input PWM signal and a motor current, said velocity controller comprising:

(i) an estimator connected to said motor, said estimator adapted to use fuzzy logic to generate an estimated motor velocity after receiving said PWM signal

and said motor current; and

(ii) a PI controller connected to said estimator and said motor, said PI controller adapted to generate a PWM signal after receiving a reference velocity and said estimated motor velocity.

4. (original) The priming station in claim 3 wherein said PI controller comprises:

(1) an initial summing junction which compares said reference velocity and said estimated motor velocity and generates an error signal;

(2) an integrator which receives said error signal and generates a value for multiplication by an integral constant;

(3) a means for multiplying said error signal by a proportional constant;

(4) a means for multiplying said value received from said integrator by an integral constant; and

(5) a final summing junction which add the value of the signal generated by said proportional constant means and the value of the signal generated by said integral constant means and generates a sum as a PWM signal to said motor.

5. (original) A method for controlling the velocity of a DC electric motor, said motor having an input PWM signal and a motor current, said method comprising the following steps:

(1) providing said PWM signal and said motor current to an estimator connected to said motor;

(2) using said estimator, generating an estimated motor velocity using fuzzy logic;

(3) providing a reference velocity and said estimated motor velocity to a PI controller; and

(4) using said PI controller, generating a PWM signal based upon said reference velocity and said estimated motor velocity.

6. (original) The method in claim 5, comprising the additional step of calibrating said motor by the following method:

a) choosing at least one PWM duty cycle value of interest;

b) applying a startup PWM duty cycle of sufficient magnitude to ensure motion of said motor;

c) performing a first test wherein the first chosen duty cycle is applied in at least two periods, each of said periods being of opposite polarity from the period preceding it, and the

current in said motor is measured during each of said periods;

d) performing a test for each additional chosen PWM duty cycle value of interest, wherein each of said PWM duty cycles is applied in at least two periods, each of said periods being of opposite polarity from the period preceding it, and the current in the motor is measured during each of said periods; and

e) calculating the apparent resistance of the motor.

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IN THE UNITED STATES

PATENT AND TRADEMARK OFFICE

APPLICANT: Michael A. Marra
Randall D. Mayo

FILING DATE: August 16, 2001

TITLE: Electric Motor Velocity Controller

SERIAL NO: 09/931,434

GROUP ART UNIT: 2837

EXAMINER: Marlon T. Fletcher

ATTORNEY DOCKET NO.: 2001-0325

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- Petition for Extension (three (3) sheets);
- Check in the amount of $110.00;
- Stamped, return postcard.

is being deposited with the United States Postal Service under 37 CFR 1.8 on the date shown below with sufficient first class mail postage and is addressed to the Mail Stop: Non-Fee Amendment, Commissioner for Patents, P. O. Box 1450, Alexandria, VA 22313-1450.

JUN 1 9 2003

Date

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